Amendments to the Specification:

On page 1, at line 1, please amend the title to read: METHOD FOR FORMING A BRITTLE ZONE IN A SUBSTRATE BY CO-IMPLANTATION.

On page 1, at line 5, insert the following paragraph:

This application claims benefit of priority to French Patent Application No. FR 0213934 filed November 7, 2002.

On page 1, please replace the paragraph at line 2 with the following amended paragraph:

TECHNICAL FIELD

The invention relates to separating a thin layer at the surface of a "source" substrate, usually to transfer the thin layer onto a "target" substrate.

On page 1, please replace the paragraph at line 5 with the following amended paragraph:

BACKGROUND

There are many examples of applications in which layer transfer techniques represent a solution to the problem of integrating layers onto a support that is *a priori* unsuitable for producing them. The transfer of a thin layer onto another support gives engineers a valuable option to design structures that are otherwise impossible.

On page 5, please replace the paragraph at line 32 with the following amended paragraph:

BRIEF SUMMARY

To remedy this drawback, in a first aspect, the invention proposes a method of fabricating a thin layer, in which a weak buried region is created by implanting a chemical species in a substrate in order thereafter to be able to initiate a fracture of said substrate along said weak region in order to detach said thin layer therefrom, said

method being noteworthy in that it includes the following steps:

On page 2, please replace the paragraph at line 25 with the following amended paragraph:

French Patent ~~application~~ No. FR-2 681 472 discloses one such process. The species implanted create a buried region that is weakened by the presence of defects such as microcavities, in particular microbubbles (which are essentially spherical in shape) or platelets (which are substantially lens-shaped). The buried region and the surface of the source substrate together delimit a thin layer that is subsequently transferred onto the target substrate.

On page 2, please replace the paragraph at line 31 with the following amended paragraph:

For other ways of creating a buried layer weakened by implanting one or more gaseous species, see also ~~the documents~~ U.S. Patent No. US-5,374,564 (~~or~~ also EP-A-53351), U.S. Patent No. US-6,020,252 (~~or~~ also EP-A-807970), French Patent No. FR-2 767 416 (~~or~~ also EP-A-1010198), French Patent No. FR-2 748 850 (~~or~~ also EP-A-902843), French Patent No. FR-2 748 851 and French Patent No. FR-2 773 261 (~~or~~ also EP-A-963598).

On page 5, please replace the paragraph at line 4 with the following amended paragraph:

PCT Patent ~~application~~ Publication No. WO 99/39378 discloses a method of reducing the thickness of the disturbed layer present on the surface of the transferred thin layer after the fracture step. The document proposes multiple implantations in the source substrate. The steps consist in:

On page 5, please replace the paragraph at line 4 with the following amended paragraph:

The general principle of ~~this~~ ~~invention~~ the above-referenced patent publication lies in a sequence of two or more implantation steps at two or more different depths.

The expression "main peak" is used hereinafter to designate the implanted species peak at which the fracture is to be effected subsequently, and the expression "secondary peak" is used hereinafter to designate all other implanted species.

On page 6 please replace the paragraphs beginning at lines 3, 5, 12, and 14 with the following amended paragraphs:

a) ~~a "main" implantation of a "main"~~ implanting a first chemical species in the substrate at a ~~"main"~~ first depth, and

b) ~~at least one "secondary" implantation of at least one "secondary"~~ implanting at least one second chemical species ~~less effective than the main species at weakening the substrate~~, in the substrate at a ~~"secondary"~~ second depth different from said ~~main~~ depth and at a concentration higher than the concentration of the ~~main~~ first chemical species, wherein said second chemical species is less effective than said main chemical species at weakening the substrate; and

wherein said steps a) and b) can be executed in either order~~, and in that it further includes the following steps:~~;

c) ~~migration of~~ differing at least a portion of said ~~secondary~~ second chemical species from said second depth ~~up~~ to the ~~neighborhood~~ vicinity of said first ~~the main depth~~, and

d) ~~initiation of~~ initiating said fracture along ~~the main~~ said first depth.

On page 8, please replace the paragraph at line 26 with the following amended paragraph:

BRIEF DESCRIPTION OF THE DRAWING

Other aspects and advantages of the invention will become apparent on reading the following detailed description of particular embodiments of the invention provided by way of nonlimiting examples. The description refers to the appended drawings, in which:

On page 8, please replace the paragraph at line 30 with the following amended paragraph:

FIG. ~~figure~~ 1 is a graph showing the concentration profiles of hydrogen ions or atoms implanted in a substrate as a function of the depth in the substrate, for three implantation doses indicated by way of example~~;~~;

On page 8, please replace the paragraph at line 33 with the following amended paragraph:

FIG. ~~figure~~ 2 is a graph showing the thickness of the disturbed region as a function of the implantation dose in the case of implanting H^+ ions in silicon~~;~~;

On page 8, please replace the paragraph at line 35 with the following amended paragraph:

FIGs. 3A to 3D ~~figures 3a to 3d~~ show the successive main steps of the method according to the invention~~;~~; and

On page 9, please replace the paragraph at line 2 with the following amended paragraph:

FIG. ~~figure~~ 4 is a graph showing the concentration profiles, as a function of the depth in the substrate, of the main species and the secondary species implanted during the steps shown in Figures 3A and 3B ~~figures 3a and 3b~~.

On page 9, please replace the paragraph at line 5 with the following amended paragraph:

DETAILED DESCRIPTION

FIG. 1 ~~**Figure 1**~~ shows, by way of example, three implantation profiles of H^+ ions in a silicon substrate. The profiles show the concentration (expressed as a number of hydrogen ions or atoms per cm^3) obtained in the substrate as a function of the depth below the implanted surface of the substrate, at ion implantation doses of 1.5×10^{16} H^+/cm^2, 6.0×10^{16} H^+/cm^2, and 1.0×10^{17} H^+/cm^2, and at an energy of approximately 75 keV. The figure indicates, purely by way of illustration, the minimum concentration level (critical concentration) that leads to the appearance of crystal defects caused by ion implantation.

On page 9, please replace the paragraph at line 28 with the following amended paragraph:

FIGs. ~~Figures 3a to 3d~~ 3A to 3D show the successive main steps of a method according to an embodiment of the invention.

On page 9, please replace the paragraph at line 30 with the following amended paragraph:

FIG. ~~Figure 3a~~ 3A shows the implantation of a source substrate 1 with a "secondary" chemical species 2, which creates a concentration of the secondary species 2 within the substrate 1 about a "secondary" depth peak 3.

On page 9, please replace the paragraph at line 33 with the following amended paragraph:

FIG. ~~Figure 3b~~ 3B shows implantation with a "main" chemical species 4 from above the same portion of the substrate 1, which creates a concentration of the main species 4 within the substrate 1 about a "main" depth peak 5.

On page 10, please replace the paragraph at line 11 with the following amended paragraph:

FIG. ~~Figure 3c~~ 3C shows the next step of this embodiment of the invention. During this step, heat treatment is preferably applied (furnace and/or local heating and/or a laser beam, or otherwise), as explained in the introduction. A large fraction of these species then feeds the crystal defects at the level of the main peak (5) and encourage the growth of these defects.

On page 10, please replace the paragraph at line 16 with the following amended paragraph:

Finally, ~~figure 3d~~ FIG. 3D shows the conventional operation of fracturing the substrate 1 at the main depth 5 in order to detach from the source substrate 1 a thin layer 6 that can where appropriate be transferred onto a target substrate (not shown). Detachment exposes a fine disturbed layer 7 on the surface of the thin layer 6 (and another disturbed layer on the surface of the source substrate 1).

On page 11, please replace the paragraph at line 19 with the following amended paragraph:

The advantage of the method according to the invention over the technique described in ~~the document~~ PCT Patent Publication No. WO 99/39378 is that, because of the different properties of the two species implanted at the level of the main and secondary peaks, the dose implanted at the level of the main peak can be enormously reduced compared to the usual dose necessary in the case of a single implantation (for example in the case of implanting only hydrogen ions in silicon, the usual dose is from 5×10^{16} to 10^{17} H^+/cm^2). The present inventors have measured a reduction in the main species dose as high as 80%. In parallel with this, the concentration of the species 2 implanted at the level of the secondary peak 3 can significantly exceed the concentration of the species 4 implanted at the level of the main peak 5, as can be seen in FIG. ~~figure~~ 4. Thus the secondary peak 3 serves as a reservoir of secondary species 2 intended to migrate toward the main peak 5.